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OFFICE OF THE VICE CHANCELLOR FOR RESEARCH
119 CALIFORNIA HALL #1500

BERKELEY, CALIFORNIA 94720-1500

February 20, 2013

Congressman Henry Waxman, Co-Chair
Senator Sheldon Whitehouse, Co-Chair
Bicameral Task Force on Climate Change

Dear Congressman Waxman and Senator Whitehouse,

We are delighted and honored to have been asked to reply to your thoughtful and critically important request for recommendations as to:

1. What actions or policies could federal agencies adopt, using existing authorities, to reduce emissions of heat-trapping pollution?
2. What actions or policies could federal agencies adopt, using existing authorities, to make our nation more resilient to the effects of climate change?
3. What legislation would you recommend Congress enact to strengthen the ability of federal agencies to prevent and respond to the effects of climate change?

In framing recommended actions, we are mindful both of President Obama's emphasis on climate change in his second Inauguration Speech and the promise of legislative attention to these issues reflected in the creation of your Bicameral Task Force.

The University of California, Berkeley and the Lawrence Berkeley National Laboratory advance climate change research, energy innovation, and sustainability science, as well as economics, law and policy scholarship, as key elements of our educational and research missions. In addition to this response to your call for suggested federal action, we offer to engage with the Bicameral Task Force as an ongoing partner as different initiatives and policies are examined and evolve. Please call on us as needed to support the work of the Task Force, including testifying as needed.

It is clear that current politics are highly polarized on energy and climate issues, so sustainable solutions will need to address a diverse set of challenges— not only climate, but also job creation, industrial leadership and national strategy, leveraging an interdisciplinary mix of technical, social, business and policy approaches.

This initial response to your call for recommendations presents complementary sets of ideas addressing: proactive ways to address drivers of global warming, including reducing heat-trapping gas emissions; more responsive ways to make help the nation more resilient to the effects of climate change; and additional considerations related to new federal legislation.

We describe our response within the framework of two complementary sets of ideas, one of which is proactive in terms of addressing the core source of global warming, and another aimed at a more responsive set of solutions to emerging climatic events, specifically adaptation strategies, making our nation more resilient to the effects of climate change.

In terms of addressing the first set of ideas mentioned above, we have focused on specific critical areas and actions. We see three starting points to a portfolio of responses that fit with the President's call for action:

1. Sustain innovation to make clean energy a leadership, scientific, engineering and business priority for the nation;
2. Create and expand attractive markets for clean energy products, and efforts to make international markets more accessible for US-based businesses; and
3. Efforts to rebalance the economic analysis of energy and environmental choices to reflect the true costs to the nation of our current and potential future costs, as well as understanding the risks and costs of environmental change.

We utilize these categories to organize and comment on a set of transformative initiatives that we at UCB/LBNL see as viable avenues to address the three types of initiatives for which you are requesting input.

Sustain innovation to make clean energy a leadership, scientific, engineering and business priority for the nation.

- Increase overall support for ARPA-E (current support levels ~ \$200M/year are insufficient to the task). Sustained and consistent funding for innovation has been quantitatively demonstrated to be a key driver of private-sector investment.
- Support full-spectrum approaches linking basic science and innovation, with market innovation, finance and deployment to key technology sectors that can unlock wider gains across the energy generation/use landscape. As an example, the SunShot initiative of the U.S. Department of Energy drives solar energy toward grid-parity costs by 2020 ("\$/watt solar"). Technology areas where this approach could be particularly important:
 - a) Carbon capture and storage: addressing the full life-cycle of emissions;
 - b) Energy storage for both stationary approaches and mobile ones (eg electric vehicles);
 - c) Transmission and distribution at both grid and micro-grid scales, including breakthrough technologies such as wireless transmission.

Create and expand attractive markets for clean energy products, and efforts to make international markets more accessible for US-based businesses.

- Identify barriers to the adoption of low-carbon energy technologies where ancillary technologies and practices could transform the sector. As an example, the SunShot initiative of the US Department of Energy is focused on driving the costs of solar energy to grid-parity costs by 2020 ("\$/watt

- solar”). A particularly effective federal integrative activity would be to establish an inter-agency group designed to identify these challenges and opportunities across a diverse set of technologies.
- Enable and launch ‘clean energy’ or ‘green’ banks at the federal, regional, state and local levels. Incentives for banks that specialize in these technologies can be exceedingly effective in bringing project developers and financiers together.
 - While a well-crafted national renewable energy standard for electric utilities could dramatically increase and then stabilize domestic markets, the reality of differing resources in various states has stalled efforts to create a singular national standard. Instead, require each state to create its own standard, and reward states for higher targets with research and development funds and by relaxing dormant Commerce Clause restrictions to enable more ambitious states to promote local economic development.
 - Create a “Race for the Top” for renewable energy by awarding federal funds to regions that establish and implement effective programs to promote renewable energy deployment across contiguous states.
 - Establish an aggressive procurement policy for the federal government that incentivizes or requires agencies to buy low-carbon technologies first. The military has been quite effective in establishing guidelines for these programs, and could be an ideal model for a wider federal effort, where the market could be 3-5 gigawatts, more than enough to accelerate the entire industry. In addition, we attach to this report the Comments of Professor (Emeritus) Arthur Rosenfeld to the Spring, 2013 Edition of the IEA’s “Journal”. We endorse the concept that a white roof is a low-carbon technology. Federal agencies already have the power to mandate all of Rosenfeld’s suggestions for federally owned or leased buildings, but Rosenfeld suggests further that the white roof mandates already in the building codes of the State of California and the cities of Chicago and New York be extended nationwide to all buildings with flat roofs.
 - Identify and reward or enable the deployment of energy technologies in dual-use contexts. For example, solar deployment along aqueducts (where permitting, and land use/land ownership issues might be clearer than in other contexts). This reduces the cost of deployment, and expands the range of applications for low-carbon energy systems.
 - Streamline permitting processes through support for identifying and sharing best practices, and performance-based incentives for applicable agencies linked to federal funding streams. A prime example is the ‘priority permitting’ for solar home system permits that some cities have adopted (e.g. Oakland, CA), which saves homeowners and contractors significant time at municipal permitting offices.
 - Engage the Farm Bill as an avenue to fund and provide extension for the deployment of cost-effective solar, wind, biomass, and geothermal energy to meet local energy needs and to enhance employment. Analysis indicates very significant employment benefits from the deployment of low-carbon energy technologies in farming regions.
 - Engage a federal-state task force on the re-invention of the utility business and innovation model. This effort, sometimes called ‘Utility 2.0’ would look in detail at the costs and benefits of facilitating large-scale grids relative to investing in distributed energy as the backbone of the physical network and the business proposition.
 - Launch a federal commission to evaluate the impacts of subsidies in the energy sector, including for first-generation biofuels, fossil-fuels, among other issues.

Efforts to rebalance the economic analysis of energy and environmental choices to reflect the true costs to the nation of our current and potential future costs, as well as understanding the risks and costs of environmental change.

- A carbon tax that returns the revenue from the tax to the citizens. While the initial response to anything termed tax can be a challenge, the additional element of dividend repayments, or direct off-sets of other taxes can arguably change this calculus in ways that may gain bi-partisan support.
- Standardize financial products to make investing in energy efficiency and renewable energy for homes, businesses, and renters as easy as the products that are available for home renovations. At outlets such as *Home Depot*, loans for home improvement are available ‘at the counter’ when consumers are examining hardware for their home or office renovation.
- Launch first a national, and then a global Directorate or Commission on clean energy innovation. While firms usefully compete to drive down prices, governments and government laboratories can usefully cooperate to identify key technology and enabling policy needs. Examples where the US could launch and chair or co-chair key international efforts include: standardization of electric vehicle charging and information technology infrastructure; ‘soft costs’ associated with solar energy systems; and permitting and the dissemination of emissions testing for the use of urban waste for power generation so that local governments do not need to take on this significant management burden.
- Create a national Manufacturing Policy. Currently the US is the only major industrial economy without one. Such an initiative would tie closely to the recommendation above, that a clean energy innovation Directorate is needed to coordinate activities across agencies that are not currently significantly engaged in these issues. Sematech, in the semiconductor space, is a particularly useful example that could serve as a model for clean energy, and could further be used as a model for an international effort that the U. S. could chair or co-chair.
- Gather information and disseminate best practices for urban agriculture and urban silviculture, practices that have significant co-benefits.
- Identify opportunities for federal support and encouragement of increased recycling efforts at the local level. These efforts can include “take-back” and “upcycling”, both of which are supply chain programs more commonly seen in Europe than the U. S.
- Launch and empower an inter-agency water-energy-climate nexus task force that examines the opportunities to minimize the water demand for energy, and the energy demand of water movement and treatment. Preliminary studies have indicated very significant *carbon and cost* savings that are possible for both of these critical resources.

Making our nation more resilient to the effects of climate change

In addition to clean energy technologies and carbon taxes, the nation must address the more immediate and significant threats posed by climate change. These pervasive threats extend to the personal safety of individuals, the stability of the national infrastructure, the economy and the national security of the United States¹.

A large array of federal agencies (including NOAA, FEMA, HUD, ACE, DOT, and DHHS) should be involved in addressing this imminent threat. We propose a four-pronged approach. The first of these approaches involve proactive measures focused on *vulnerable settlements and infrastructures*, which can be directly undertaken to reduce the potential destruction of escalating natural disasters and other calamities resulting from climate change. They must include:

¹ Michael McElroy and D. James Baker, “Climate Extremes: Recent Trends with Implications for National Security”, Harvard University, Center for the Environment, October 2012
http://environment.harvard.edu/sites/default/files/climate_extremes_report_2012-12-04.pdf

1. Reducing the vulnerability of coastal and flood plain communities to severe storms and resultant storm surges through construction of protective infrastructure. Elsewhere in the world, large infrastructural projects, such as the Thames Barrier in England and the Oosterscheldekering in the Netherlands, have successfully protected coastal cities. The destruction resulting from Superstorm Sandy and Hurricane Katrina has been estimated to have caused \$50 billion and \$108 billion (\$128 billion adjusted for 2012) respectively in damages²; such extensive damages begin to rapidly justify these preventative infrastructural investments. In addition, planning policies and construction regulations must be revised to establish riparian buffer zones, facilitate relocation away at-risk locations, and rebuild wetlands, estuaries, dunes, and barrier island systems.
2. Investing in resilient infrastructures to make communities, transportation networks, and other major infrastructure systems more resilient in the face of diverse and growing climate challenges. Recently, in the United States prolonged and geographically uncommon heat waves have resulted in the buckling of rail ties which have been blamed for train derailments³. Alternately, extreme ocean temperatures have forced coastal nuclear power plants to shut down for lack of a properly conditioned cooling element⁴. Systematic replacement of aging infrastructure with more resilient infrastructures is required to accommodate challenges linked to climate change.

The second part of our recommendations on adaptation and resilience relate to *social vulnerability and environmental justice*. The experience of recent extreme weather events related to climate change revealed the differential vulnerability of individuals to health risks and social dislocation. Prolonged heat waves led to mortality among older people who were also poor, isolated, and living without air conditioning. Poor people and people of color suffered disproportionately during both Hurricanes Katrina and Sandy, due to lack of mobility, the location of their communities in more vulnerable locations with other infrastructure, and social isolation and lack of social networks that more affluent residents were able to mobilize in these emergencies. Improving the resilience of vulnerable communities will require targeted investments in their physical infrastructure, transportation options, and health care service delivery systems.

The third part of our suggested approach involves measures to develop new *adaptive response technologies* to improve emergency response in the wake of climate-related disruptive events. In the past decade frustrated Americans have repeatedly watched a series of inadequate responses to environmental disasters. New adaptive response technologies include mobile sensor-based

² Porter, David “Sandy was second in cost to Katrina, *Philly.com*, February 13th, 2013 – Retrieved February 13th, 2013, http://www.philly.com/philly/news/nation_world/20130213_Sandy_was_second_in_cost_to_Katrina.html

³ “D.C. Metro Derailment: Excessive Heat To Blame”, *Huffington Post*, July 7th, 2012 –2013 http://www.huffingtonpost.com/2012/07/07/dc-metro-derailment-heat_n_1656448.html

⁴ Wald, Matthew “Heat Shuts Down a Coastal Reactor”, *The New York Times*, August 13th, 2012 – Retrieved February 13th, 2013 <http://green.blogs.nytimes.com/2012/08/13/heat-shuts-down-a-coastal-reactor/>

monitoring devices and communications/coordination networks; advanced scenario and simulation planning technologies to prepare responders and communities for disruptive circumstances; and redundant control systems that can be geographically dispersed to help ensure that vital systems within a disaster zone continue to operate despite one control center or system being compromised.

The fourth aspect of our approach relates the governance of communities, cities, and metropolitan regions. Climate change poses a national threat and requires vigorous national responses. But many measures to render the nation's communities, cities and regions more adaptive and resilient must be tailored to specific places and contexts, and involve land use and transportation systems that fall under state and local jurisdiction. But local land use and transportation planning powers in the US are weak and typically dominated by home rule politics and policies that limit the capacity of agencies to address vulnerable settlement patterns, land use and construction practices, and infrastructural decision-making. Robust evidence-based metropolitan planning authorities that involve diverse stakeholders, empowered by legislation such as California's Sustainable Communities and Climate Protection Act of 2008, will be required to address such weaknesses in governance.

We appreciate this opportunity to participate in formulating plans for a federal government approach to address climate change. We are impressed by the list of 300 organizations to which the request for assistance was sent. We are certain that you will receive many excellent suggestions for action from these organizations. We believe we can also serve this effort by offering to provide assistance in analyzing and prioritizing the hundreds of actions that will be offered. We would be pleased to work with you on such an effort. As you will see below, a number of UC Berkeley faculty and Laboratory scientists participated in formulating our suggestions. In order to maximize the expertise of any subsequent correspondence about our proposals, please direct such requests to Graham R. Fleming, Vice Chancellor for Research, University of California, Berkeley (vcrfleming@berkeley.edu).

Yours sincerely,



Graham Fleming
Vice Chancellor for Research &
Melvin Calvin Distinguished
Professor of Chemistry
University of California, Berkeley



Paul Alivisatos
Director, Berkeley National Lab &
Professor of Chemistry
University of California, Berkeley

Daniel M. Kammen

Dan Kammen
Class of 1935 Distinguished Professor of Energy
Professor in Energy and Resources Group &
Goldman School of Public Policy
Department of Nuclear Engineering
Founding Director, Renewable & Appropriate Energy Laboratory
University of California, Berkeley

R. Ramesh

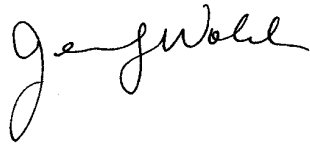
R. Ramesh
Professor of Materials Science, Engineering & Physics
University of California, Berkeley &
Founding Director, SunShot Initiative, US Department of Energy

Art R

Arthur Rosenfeld
Distinguished Scientist Emeritus
Berkeley National Lab

Paul Wright

Paul Wright
Director, Center for Information Technology in the Interest of Society (CITRIS) &
Director, CITRIS @ Berkeley
A. Martin Berlin Professor of Mechanical Engineering
University of California, Berkeley

A handwritten signature in black ink, reading "Jennifer Wolch". The signature is fluid and cursive, with the first name "Jennifer" and last name "Wolch" clearly distinguishable.

Jennifer Wolch
Dean, College of Environmental Design &
William W. Wurster Professor of City & Regional Planning
University of California, Berkeley